

# High-Speed Rail and Students' Mobility:

## Can High-Speed Rail influence university students' educational choice in Italy?

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# Literature Review



In scientific literature, university students' mobility in Italy, both national and international, has been studied focusing on **attractiveness characteristics of Universities** and on the **contextual factors**, e.g. D'Agostino, Ghellini and Longobardi (2018); Enea and Attanasio (2019); Bacci and Bertaccini (2020); Columbu S. et al. (2021)

Main findings

- **Socioeconomic conditions** of origin and destination, such as income and labour market, are determinants for student mobility;
- **Universities' characteristics** are also key factors, such as educational supply, quality and prestige, level of internationalization;
- National student mobility in Italy follows predominantly the South to Centre-North direction, contributing to the **territorial disparities**.



Transportation factor is not addressed in the study of tertiary education students' mobility

# Motivation and Research Question 1/2



Cattaneo M. et al. (2015) *“Evolution of long distance students' mobility: The role of the air transport service in Italy”*

**Aim**

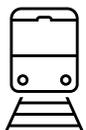
To study the impact of the air transport service on university accessibility for long distance students

**Method**

Gravity model on a sample of 48 airports for 75 universities observed during 2003–2012

**Result**

Travel speed increases the flow of students (300 km far away from the home province) moving towards a university



**There is a gap in the literature on the impact of high-speed rail on students' mobility**

**As air transport does, High-Speed Rail (HSR) can benefit local areas where they stop by facilitating an **inflow** of high-skilled human capital, but it can also lead to an **outflow** of it**



**HSR increases accessibility through the reduction of travel times and the increase of service**

# Motivation and Research Question 2/2

The percentage of off-site students in Italy has increased over the period analysed

**+10% (2019/2010)**

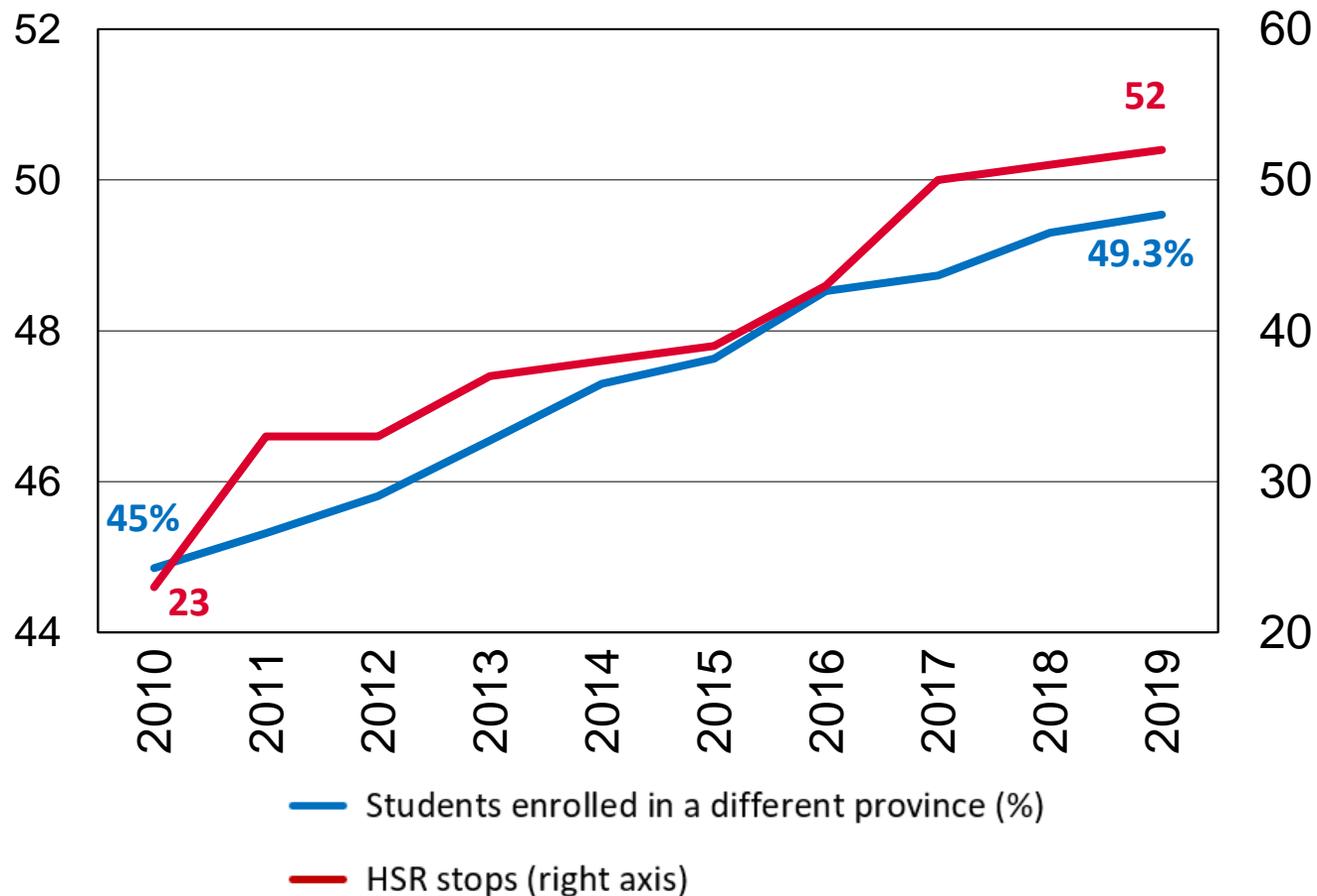
An increasing number of Italian Cities has been included in HS train service

**+126% (2019/2010)**

How do university student flows respond to the opening of a HSR stop in a given city?



Staggered Difference in Differences



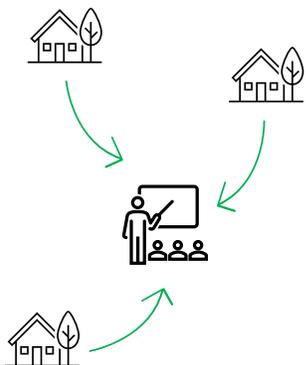
# Dataset 1/2

Administrative data on University students in Italy from academic year 2010/2011 to 2018/2019

Outcome variables

## University Student Inflow

Number of first-year non-resident students enrolled in a three-year or single-cycle degree course



Covariates

Number of first year students enrolled at university

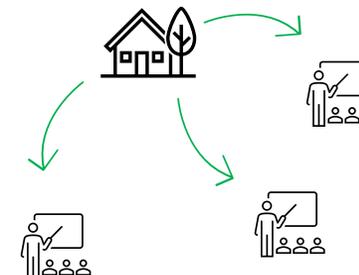


Anagrafe Nazionale Studenti (ANS)  
(National Student Registry)



## University Student Outflow

Number of first-year students enrolled in a university located outside the province of residence



Number of university courses offered

# Dataset 2/2

## Timeline for the stable activation of High-Speed Rail stops in the provinces of the Italian peninsula



52 Italian provinces where there is at least one station where High-Speed trains stop



Of which

Treatment variable

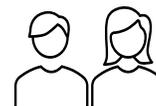
23 That had already the HSR service since 2010

29 With a staggered activation over time 

## Socioeconomic characteristics of provinces



Covariates



Resident population of high school age (14-18 years)



Unemployment rate



Geographical macro area of the province

# High-Speed Railway network in Italy

## HS Train brands:

1997  
EUROSTAR  
ITALIA

2009  
EUROSTAR  
ITALIA  
FRECCIAROSSA  
FRECCIARGENTO

2012  
FRECCIAROSSA  
FRECCIARGENTO  
.italo

time

- 1992 Firenze - Roma
- 2005 Dec Roma - Napoli
- 2006 Feb Torino - Novara
- 2007 Mar Padova - Mestre
- 2008 Jun Napoli - Salerno
- 2008 Dec Milano - Bologna
- 2009 Dec Bologna - Firenze
- 2009 Dec Torino - Milano
- 2009 Dec Roma - Napoli completion
- 2016 Dec Milano - Brescia



- HSR
- Railway stations
- Main rail network
- Regional boundary

## Relationship of HSR with conventional services:

Mixed full



Mixed conventional



Mixed high speed



Exclusive HS



# Empirical Strategy

**Staggered Difference-in-Differences** → we exploit the geographical and temporal variation in the opening of HSR stops following **Callaway and Sant'Anna DD estimator (2021)**

$$Inflow_{it} = \alpha_i + \beta_t + \gamma HSR_{it} + X_i + \epsilon_{it}$$

Unit (province) fixed effects →  $\alpha_i$   
 Time fixed effects →  $\beta_t$   
 Covariates →  $X_i$   
 Treatment dummy variable →  $HSR_{it}$   
 Parameter of interest: **Average effect of participating in the treatment (ATT)\*** →  $\gamma$

*\*in this methodology, ATT aggregates the **group average treatment effects**, where groups are formed by units that begin to be treated in the same time period*

- 23 Provinces always treated (all the largest ones) → out of the analysis
- 32 Provinces never treated
- 29 Provinces treated over time

Panel dataset of **84 provinces** observed for **10 years (2010-2019)**

# Provinces in the Dataset

Always Treated  
Group: HSR  
service since  
2010

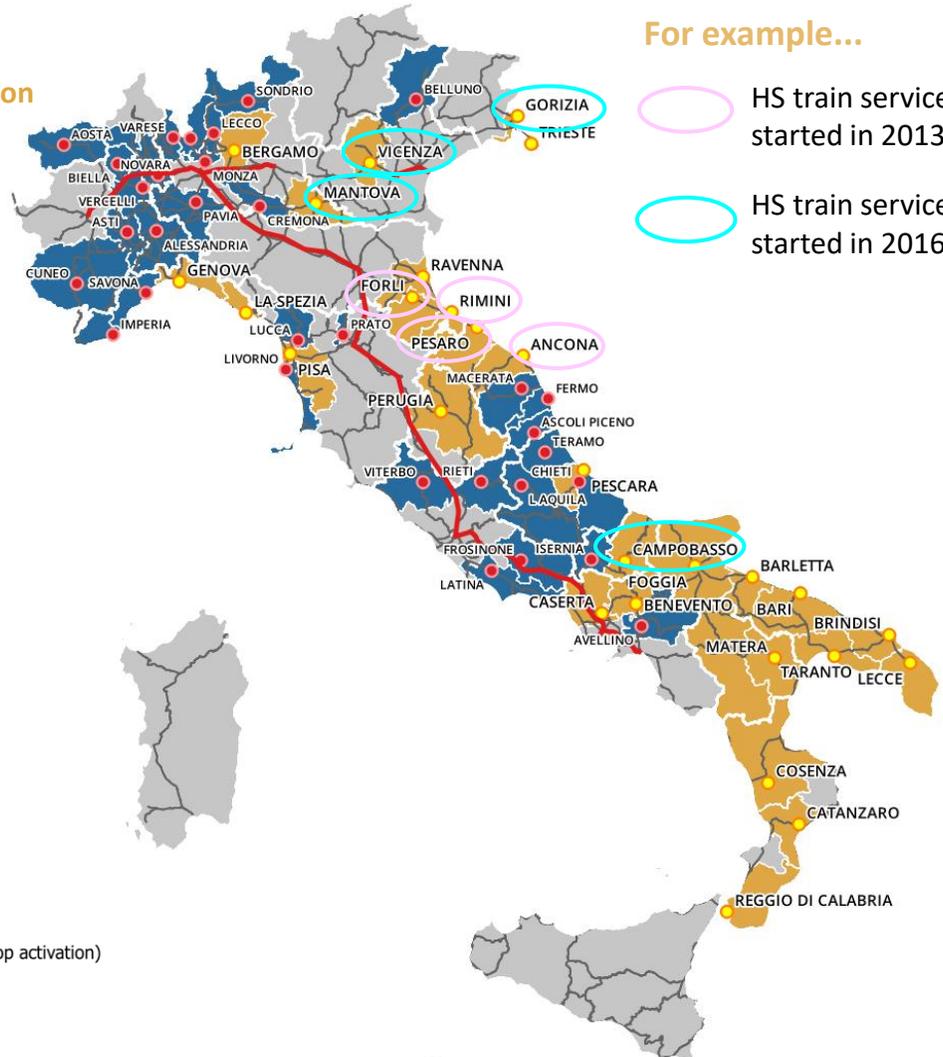


Treated Group:  
staggered activation  
over time (from  
2011 onwards)

Control Group:  
never treated  
provinces

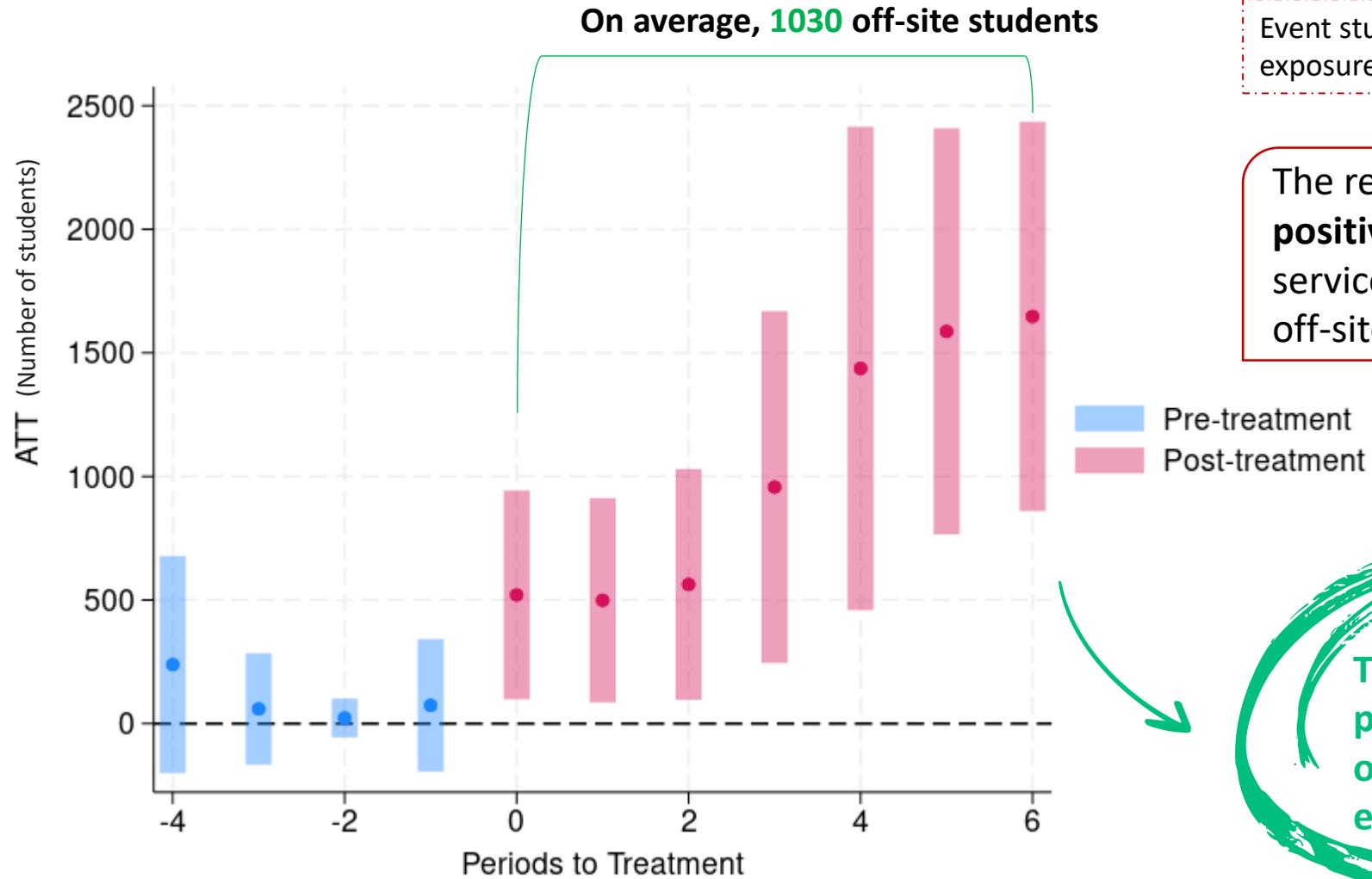
For example...

- HS train service started in 2013
- HS train service started in 2016



- Regional boundaries
- High-Speed Rail Network
- Conventional Rail network
- Always Treated Provinces
- Treated Provinces (staggered HS stop activation)
- Never Treated Provinces
- Always Treated Cities
- Never Treated Cities
- Treated Cities

# Results: Students Inflow with Covariates



Event study plot → average effect by length of exposure to treatment

The results suggest that there is a **positive causal effect** of HS train service to the enrolment of first-year off-site students

The effect increases during time: provinces with longer experience of HSR service witness higher effect on student inflow

# Conclusions and further perspectives

- The introduction of HSR service **increases student mobility** to University cities which benefit from an average increase of 1030 non-resident students with respect to the provinces which do not have high-speed train connections
- The effect increases with the persistence of the service

Aware that these are preliminary results, next steps to follow are:

- 01 Performing **robustness check** through the use of other methodologies and/or other control variables and rail variables
- 02 Model the **Outflow of students**, which may follow different path
- 03 Assess the **net effect** to understand the economy implications of student mobility which will form **high skilled human capital**

# Bibliography:

Out-migration of university enrolment: the mobility behavior of Italian students – *D'Agostino, Ghellini and Longobardi (2018)*

La mobilità degli studenti universitari nell'ultimo decennio in Italia – *Enea and Attanasio (2019)*

Assessment of the University Reputation Through the Analysis of the Student Mobility – *Bacci and Bertaccini (2020)*

Geography of Italian student mobility: A network analysis approach – *Columbu S. et al. (2021)*

Evolution of long distance students' mobility: The role of the air transport service in Italy – *Cattaneo M. et al. (2015)*

Difference-in-differences with multiple time periods – *Callaway and Sant'Anna (2021)*



**Thanks for your attention!**

